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CONTROL OF SPUR BLIGHT OF RED RASPBERRIES

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ABSTRACT

SPUR blight, *Didymella applanata* (Niessl.) Sacc., of red raspberries caused severe losses in many plantings thruout New York State from 1938 to 1944, inclusive.

Of the varieties observed, Indian Summer and Taylor were the most susceptible; Newburgh, Latham, and Milton were moderately susceptible; while Ontario, Viking, Cuthbert, Marcy, and Chief were the least susceptible.

Two applications of bordeaux mixture, 6–10–100, and Cuprocide 54, 2–100, the first when the new shoots were 10 to 12 inches high and the second about 2 weeks later, gave a reduction in the intensity of the disease. A delayed dormant application of 1 per cent Elgetol was more effective than ½ per cent Elgetol, 1 per cent Elgetol 312, lime-sulfur, 1–8, and the two applications of the copper fungicides.

The control obtained with Elgetol applied when the buds showed about ½ inch of green was better than that obtained when the application was made at the dormant or breaking-bud stages.

On Newburgh, Latham, and Chief, satisfactory control was obtained with the green-tip spray of 1 per cent Elgetol, followed by an application of bordeaux mixture, 3–3–100, when the new shoots were 10 to 12 inches high. This combination did not give control of spur blight on Indian Summer. Perfect control on Indian Summer was obtained during 2 years' tests with Fermate, 2–100, and in 1 year with the experimental material, U. S. R. No. 604, 1–100 or ½–100, when two applications were made, the first when the new shoots were 10 to 12 inches high and the second 2 weeks later.

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INTRODUCTION

Spur blight of red raspberries, sometimes referred to as purple cane spot, is caused by *Didymella applanata* (Niessl.) Sacc., and has become of increasing importance in New York State, particularly in the Hudson Valley. A severe attack of spur blight in which a large number of spots or lesions are present on the cane utimately results in the death of the cane or weakens it so that it is subject to winter injury. Buds located in diseased areas may become so badly weakened that they fail to produce fruit. Many plantings of red raspberries have been observed which were abandoned because of spur blight. Except for mosaic, spur blight causes more loss than any of the other red raspberry diseases in the Hudson Valley and in some other areas thruout the State.

Koch[1] suggested that one or two applications of a 6–10–100 bordeaux mixture would give some control of spur blight, while Crosby, *et al.*[2], suggested that two applications of bordeaux mixture, 8–12–100, might be necessary to hold the disease in check.

Due to the extreme prevalence of spur blight, it was deemed advisable to determine the correctness of these control methods, the relative efficiency of various fungicides, and the effectiveness of applications made during the spring at different stages in the development of raspberry canes. Following the publication of a preliminary report[3] concerning the investigations on the control of spur blight, Mills and Evans[4] revised the suggested spray schedule recommendations for the control of this disease.

This bulletin presents the results of experiments conducted during the past 7 years on the development of an efficient and economical spray schedule for the control of spur blight on red raspberries.

[1]Koch, L. W. Spur blight of raspberries in Ontario caused by *Didymella applanata*. *Phytopath.*, **21**: *247–287. 1931.*

[2]Crosby, C. R., Mills, W. D., and Evans, J. A. Diseases and insects of small fruits. *Cornell Univ. Agr. Ext. Bul. No. 306. 1934.* (Revised 1937.)

[3]Suit, R. F. New developments in the control of diseases of small fruits. *Proc. New York State Hort. Soc.*, **85**: *262–269. 1940.*

[4]Mills, W. D., and Evans, J. A. Diseases and insects of small fruits. *Cornell Univ. Agr. Ext. Bul. No. 306. 1934.* (Revised 1943.)

MATERIALS AND METHODS

Tests on the control of spur blight were conducted in growers' plantings where the disease was known to be prevalent. During the course of the investigation, control studies were made with Newburgh, Latham, Chief, and Indian Summer red raspberries. Bordeaux mixture, Cuprocide 54 and 54–Y, Yellow Cuprocide, Fermate, U. S. R. No. 604 (2, 3, dichlor-naphthoquinone), Dithane, Elgetol, Elgetol 312, Di-nitro powder D–145 (fusion mix — 40 per cent dinitro-orthol-cresol and 60 per cent bentonite), and lime-sulfur were tested at various times during the course of the investigation.

Each experimental plot consisted of a row or a section of a row 100 feet long. All treatments were applied at least in duplicate, but in most cases four replicates were used. The sprays were applied to both sides of the row with a two-nozzle broom at a pressure of 300 pounds. When cover sprays were applied, they were directed towards the new shoots only. Records on the occurrence of the disease were made in September, at which time counts were made of the number of diseased canes and the number of diseased spots per cane.

FIG. 1.—SPUR BLIGHT ON RED RASPBERRY CANES.

In center, typical spot or lesion, which is purple in color, as it appears during the latter part of July, August, and September. On left and right, the appearance of the lesion the next spring after it has turned grey in color.

THE CAUSAL FUNGUS

Didymella applanata is not as complicated in its life cycle as many other fungi. The indications of spur blight appear about the latter part of July or during August, when the purple spots are visible (Fig. 1). Then, during the fall and winter, the fungus develops in the diseased areas and the lesions become grey in color (Fig. 1). About the middle of May, the perithecia can be found (Fig. 2) in the diseased areas. These perithecia then discharge ascospores during favorable weather conditions. The ascospore

discharge may extend to the first part of July, depending on weather conditions. Normally, the maximum discharge can be expected during the first half of June. The ascospores infect the leaves on the new shoots, but under extremely favorable conditions they may infect the canes directly. When the leaves are infected, a brown V-shaped lesion soon develops. The fungus then grows down thru the petiole to the cane and invades the cane tissue around the bud. Thus, a purple spot again is produced and the life cycle is completed.

It appears that fungicides applied to the foliage of the new canes should protect them from infection by the ascospores. Further, if a fungicide which would kill the perithecia were applied to the diseased fruiting canes, there would be no ascospores formed to spread the disease to the new canes.

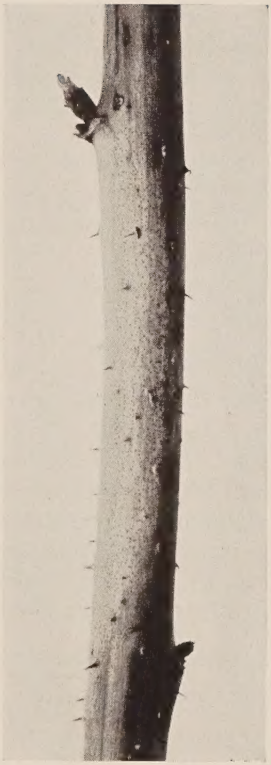

FIG. 2—A SPUR BLIGHT LESION AS IT APPEARS IN THE SPRING.
Note the perithecia which appear as black dots in the diseased area.

EXPERIMENTAL RESULTS

VARIETAL SUSCEPTIBILITY

In 1938 it was observed that spur blight was quite prevalent in the raspberry variety planting of the Division of Pomology located on the Station grounds at Geneva. Data on the occurrence of spur blight were recorded over a period of 3 years in 10 of the more important varieties. The data (Table 1) show that Indian Summer and Taylor were extremely susceptible, while Newburgh, Latham, and Milton were moderately susceptible. Chief, Marcy, and Cuthbert were slightly susceptible, while Viking and Ontario showed the least disease of any of the varieties observed. The same order of susceptibility to the disease was found when the varieties were observed in various plantings thruout the State.

CONTROL

The first experiments (1938) were planned to test the suggested bordeaux mixture, 6–10–100, for its effectiveness in the control of

TABLE 1.—PREVALENCE OF SPUR BLIGHT IN SOME VARIETIES OF RED RASPBERRIES GROWN AT GENEVA, N. Y.

VARIETY	PERCENTAGE OF CANES DISEASED		
	1938	1939	1940
Ontario	15.0	5.6	3.1
Viking	17.1	1.0	3.8
Cuthbert	22.0	3.8	28.7
Marcy	23.3	12.6	1.0
Chief	28.4	15.4	8.7
Newburgh	32.3	18.1	21.9
Latham	33.1	17.8	11.3
Milton	75.0	21.2	13.0
Taylor	54.3	67.4	70.0
Indian Summer	85.8	67.9	81.1

spur blight. Two concentrations of Cuprocide 54 also were included to determine whether or not an insoluble copper might be satisfactory. The results obtained from tests on three different farms showed that the control was rather poor (Table 2). Based on the reduction in the number of spots per diseased cane and the reduction in the percentage of diseased canes, it appears that some control was obtained; however, the control was not satisfactory. The disease was the most severe on the Newburgh variety (Table 2).

TABLE 2.—RESULTS OF SPRAYING EXPERIMENTS FOR THE CONTROL OF SPUR BLIGHT OF RED RASPBERRIES, 1938.

FUNGICIDE*	AVERAGE NUMBER OF SPOTS PER DISEASED CANE	PERCENTAGE OF DISEASED CANES
Farm No. 1, Newburgh		
None	7.1	100.0
Bordeaux mixture, 6–10–100	2.2	87.6
Cuprocide 54, 2–100	2.7	86.0
Cuprocide 54, 1–100	3.4	100.0
Farm No. 2, Latham		
None	3.4	99.4
Bordeaux mixture, 6–10–100	1.5	80.0
Cuprocide 54, 2–100	1.2	70.5
Cuprocide 54, 1–100	1.7	78.5
Farm No. 3, Latham		
None	4.6	99.5
Bordeaux mixture, 6–10–100	1.0	62.0
Cuprocide 54, 2–100	1.1	65.0
Cuprocide 54, 1–100	1.3	62.0

*S.E.C. oil (self-emulsifying cottonseed oil) at 1 pint to 100 gallons added to all sprays. Two applications, first May 25–26, and second June 6–7, 1938.

Since the suggested spray schedule did not give satisfactory control of spur blight in the 1938 tests, the use of a caustic fungicide at the green-tip stage followed by one or two cover sprays of a copper fungicide was planned for the 1939 tests. Elgetol (sodium di-nitro-orthol-cresol) was a new material which, in laboratory tests, showed effective toxicity towards the perithecia of the spur blight fungus. Elgetol at the rate of 1 gallon to 100 gallons of spray mixture was tested on two farms and at the third farm was compared with lime-sulfur, 1–10. Cover sprays of bordeaux mixture and Cuprocide 54-Y also were applied to some of the plots. Excellent control was obtained with one application of Elgetol at farm No. 1 (Table 3) where the poorest control was obtained in the 1938 tests (Table 2). The control obtained with Elgetol at farm No. 2 and farm No. 3 was satisfactory (Table 3).

TABLE 3.—RESULTS OF SPRAYING EXPERIMENTS FOR THE CONTROL OF SPUR BLIGHT OF RED RASPBERRIES, 1939.

SPRAYS APPLIED*			AVERAGE NUMBER SPOTS PER DISEASED CANE	PERCENTAGE DISEASED CANES
Green-tip, Apr. 25	1st cover, May 25	2nd cover, June 15		
		Farm No. 1, Newburgh		
None	None	None	4.5	94.9
Elgetol, 1%	None	None	1.1	6.4
		Farm No. 2, Latham		
None	None	None	3.1	60.0
Elgetol, 1%	None	None	1.3	20.5
		Farm No. 3, Latham		
None	None	None	2.4	63.6
Elgetol, 1%	None	None	1.1	17.2
Elgetol, 1%	Cuprocide 54-Y, 2–100	None	1.0	2.7
Elgetol, 1%	Cuprocide 54-Y, 2–100	Cuprocide 54-Y, 2–100	1.0	2.5
Lime-sulfur, 1–10	None	None	1.3	20.4
Lime-sulfur, 1–10	Bordeaux mixture, 6–10–100	None	1.4	22.7
Lime-sulfur, 1–10	Bordeaux mixture, 6–10–100	Bordeaux mixture, 6–10–100	1.2	15.1

*S.E.C. oil, 1 pint to 100 gallons, added to cover sprays.

At farm No. 3, lime-sulfur, 1–10, was about equal in effectiveness to Elgetol. However, cover sprays of bordeaux mixture applied to the lime-sulfur treated plots were not as effective as the cover sprays of

Cuprocide 54-Y following the Elgetol (Table 3). The best control obtained at farm No. 3 was with Elgetol at the green-tip stage followed by one or two applications of the Cuprocide 54-Y (Table 3).

In 1939 an additional experiment was conducted in a 3-acre Latham planting which was so severely diseased that only about 10 per cent of the canes were leafing out on May 1. The canes in the whole planting were cut off at the ground level, hauled away, and burned. The remaining stubs were sprayed with lime-sulfur, 1–8. By September 15, an excellent stand of canes had been produced and only 5.7 per cent of them showed spur blight. This planting apparently was ready to be eliminated, but because of its excellent recovery, produced good crops of raspberries for 3 more years. It was not profitable after that time because of the prevalence of mosaic.

Since the single application of a suitable fungicide made at the green-tip stage appeared to be the most economical way to control spur blight, tests were conducted at four farms during 1940 to determine the relative efficiency of various concentrations of Elgetol when compared with lime-sulfur. Records obtained from these tests show that lime-sulfur, 1–8, is not as effective as 1 per cent Elgetol for the control of the disease (Table 4). While some control was obtained with ½ per cent Elgetol, it was not as good as 1 per cent Elgetol (Table 4). Excellent results were obtained at farm No. 2 with 1 per cent Elgetol and at the other three locations, if control is based on the number of diseased spots per cane. A definite decrease in disease intensity is indicated (Table 4).

In the experiments conducted during 1939 and 1940, excellent control of spur blight was obtained at only one farm during each year; otherwise, the results were unsatisfactory. In 1941 tests were conducted to determine whether the date of application with respect to the development of the canes would have any influence on the effectiveness of the disease control. As the season progresses, the perithecia in the diseased canes become more mature and can be killed easier by the fungicide. But, if the application is delayed too long, there is some probability that injury to the new leaves will result from the use of Elgetol. Sprays of 1 per cent Elgetol have been applied when the raspberry buds showed as much as 1 inch of green tissue without causing injury which could be observed 2 weeks after the date of the spray. In the 1941 experiments, the Elgetol which was applied at the latest possible date gave the best control (Table 5).

TABLE 4.—EFFECTIVENESS OF ELGETOL AND LIME-SULFUR FOR CONTROL OF SPUR BLIGHT ON RED RASPBERRIES, 1940.

FUNGICIDE*	AVERAGE NUMBER OF SPOTS PER DISEASED CANE	PERCENTAGE OF DISEASED CANES
Farm No. 1, Newburgh		
None	6.0	97.3
Lime-sulfur, 1–8	4.5	95.1
Elgetol, 1%	2.5	93.0
Elgetol, ½%	4.5	98.1
Farm No. 2, Latham		
None	2.5	55.3
Elgetol, 1%	1.0	6.3
Farm No. 3, Latham		
None	1.5	39.0
Elgetol, 1%	1.5	31.7
Elgetol, ½%	1.5	34.9
Farm No. 4, Latham		
None	3.5	78.6
Lime-sulfur, 1–8	2.5	77.2
Elgetol, 1%	1.5	52.2
Elgetol, ½%	2.0	59.9

*Sprays applied April 29 to May 1, 1940.

The control obtained on Newburgh and Chief was better than that obtained on Indian Summer, which is very susceptible to spur blight (Table 5). In general, the control secured with the best treatment in 1941 was satisfactory from the grower's standpoint, except in the case of Indian Summer.

It seemed possible that an Elgetol compound containing more toxicant might give better control of spur blight than the standard material. It also appeared reasonable that the powder form of the D. N. compound might be satisfactory. Accordingly, in the 1942 tests, Elgetol 312, which contained 50 per cent more toxicant than the standard Elgetol, was compared with the standard material at three farms, while a test of the D. N. powder D-145 was made at one farm. That year a planting of Indian Summer was found (farm No. 3) which was severely diseased and which was growing under overhead irrigation. This presented ideal conditions for a severe test. A number of treatments were made and the results show that in no case was 1 per cent Elgetol 312 superior to standard Elgetol (Table 6). The

TABLE 5.—EFFECT OF TIME OF APPLICATION ON THE CONTROL OF SPUR BLIGHT OF RED RASPBERRIES, 1941.

FUNGICIDE	DATE OF APPLICATION	AVERAGE NUMBER OF SPOTS PER DISEASED CANE	PERCENTAGE OF DISEASED CANES
	Farm No. 1, Newburgh		
None	————	4.5	68.2
Elgetol, 1%	Breaking-bud, Apr. 16	2.1	34.4
Elgetol, 1%	Late green-tip, Apr. 22	1.5	28.9
	Farm No. 2, Newburgh		
None	————	3.1	42.7
Elgetol, 1%	Breaking-bud, Apr. 14	1.3	12.6
Elgetol, 1%	Green-tip, Apr. 17	1.1	9.3
Elgetol, 1%	Late green-tip, Apr. 21	1.1	8.1
	Farm No. 3, Indian Summer		
None	————	5.8	100.0
Elgetol, 1%	Green-tip, Apr. 16	2.2	83.0
	Farm No. 4, Chief		
None	————	2.9	22.1
Elgetol, 1%	Green-tip, Apr. 15	1.0	3.9

D. N. powder D-145 was not significantly better than the standard Elgetol. Satisfactory control with the two Elgetol materials was obtained only at farm No. 1 (Table 6).

TABLE 6.—EFFECTIVENESS OF DI-NITRO COMPOUNDS FOR THE CONTROL OF SPUR BLIGHT OF RED RASPBERRIES, 1942.

FUNGICIDE	AVERAGE NUMBER OF SPOTS PER DISEASED CANE	PERCENTAGE OF DISEASED CANES
	Farm No. 1, Newburgh	
None	4.3	75.3
Elgetol, 1%	1.5	28.0
Elgetol 312, 1%	1.5	25.0
	Farm No. 2, Newburgh	
None	5.2	95.0
Elgetol, 1%	2.3	66.6
Elgetol 312, 1%	3.1	81.2
	Farm No. 3, Indian Summer	
None	4.6	89.6
Elgetol, 1%	1.9	84.8
Elgetol 312, 1%	2.2	87.5
D-145, 4–100*	2.0	80.0

*D. N. powder from Dow Chemical Company.

Since an excellent location for severe disease conditions was obtained in the Indian Summer planting with overhead irrigation, subsequent experiments were conducted there. Because Elgetol did not give a satisfactory control on Indian Summer under severe conditions, it was thought that a cover spray applied to the new shoots when they were about 12 to 15 inches high would aid in the control. This hypothesis was tested in 1943. Elgetol alone reduced the disease intensity but did not give a significant reduction in the number of diseased canes (Table 7). When a cover spray of a copper fungicide was applied to the plots which had received a green-tip spray of Elgetol, no significant increase in disease control was obtained (Table 7). The data show that a single application of the bordeaux mixture applied on June 3 was superior to Elgetol alone or to Elgetol plus the copper sprays. The best control was obtained with the cover spray of Fermate, 2–100 (Table 7). In all cases, the least control was obtained when both the green-tip and cover sprays were applied.

Table 7.—Results of Spraying Experiments for the Control of Spur Blight of Red Raspberries, 1943.

Sprays applied*		Average number of spots per diseased cane	Percentage of diseased canes
Green-tip, Apr. 21	Cover, June 3		
None	None	5.3	65.3
Elgetol, 1%	None	1.8	60.0
Elgetol, 1%	Bordeaux mixture, 3–3–100	2.3	62.0
None	Bordeaux mixture, 3–3–100	1.5	48.0
Elgetol, 1%	Yellow Cuprocide, 12 oz.–100	3.0	66.0
None	Yellow Cuprocide, 12 oz.–100	2.8	65.0
Elgetol, 1%	Fermate, 2–100	1.6	43.0
None	Fermate, 2–100	1.3	30.0

*S.E.C. oil, 1 pint–100 gallons, added to cover sprays; Indian Summer variety.

Following the indication obtained in 1943 that an organic fungicide would give superior control of spur blight, tests were conducted in 1944 to evaluate three of these materials. The first application was made on May 25 when the new shoots were 10 to 12 inches high and the second application on June 5. During this period, ascospore discharge was frequent. One-half of the plots received the first application only, while the others received both applications. Fermate, 2–100, and U. S. R. No. 604, 1–100 and ½–100, gave perfect control of spur blight when the two applications were made (Table 8), while a high degree of control resulted when only the first application was made

(Table 8). One application of Dithane, 1–100, gave excellent control (Table 8) but caused brown spots on the young canes and leaf petioles within 24 hours after the spray was applied. Consequently, bordeaux mixture was used for the second application on these plots. When bordeaux was used, the control was poor (Table 8). The injury resulting from the application of Dithane appeared very severe at the time it occurred, but did not produce any serious aftereffects since the injured canes made a normal growth during the remainder of the season. These tests indicate that the organic fungicides are very toxic to the spur blight fungus and thus give an excellent control of the disease. At present, Fermate is the only one of these organic fungicides available to growers.

TABLE 8.—EFFECTIVENESS OF ORGANIC FUNGICIDES FOR THE CONTROL OF SPUR BLIGHT ON INDIAN SUMMER RED RASPBERRY, 1944.

FUNGICIDE*	PERCENTAGE OF DISEASED CANES	
	One application	Two applications
None	51.5	—
Fermate, 2–100	4.0	0.0
U.S.R. No. 604, 1–100†	0.6	0.0
U.S.R. No. 604, ½ 100	3.3	0.0
Dithane, 1–100, 1st application	—	—
Bordeaux, 3–3–100, 2nd application	4.0	20.2

*S.E.C. oil, 1 pint–100 gallons, added to all fungicides. First application on May 25 and second application on June 5, 1944.

†An experimental material (2, 3, dichlor-naphthoquinone) from U. S. Rubber Co., Naugatuck Chemical Division, New York, N. Y.

DISCUSSION

It has been observed during these investigations that a red raspberry planting does not usually show any large amount of spur blight until it is 4 or 5 years old. Apparently, it takes this period of time for the fungus to build up to epidemic proportions in a new planting. Such factors as distance between rows, width of rows, spacing of canes in the row, freedom of the planting from weeds during May and June, and the location of the planting with regard to air drainage greatly influence the environment within the planting. If the plants do not dry off readily following rainy weather, excellent conditions for the spread of spur blight are present. The relative importance of the disease in a planting and the ease with which it can be controlled are indicative of the care the planting receives.

Normally, a planting in which proper horticultural methods are used and in which the least susceptible varieties are planted will not require fungicidal controls to suppress spur blight. However, for the more susceptible varieties and in locations where the disease is prevalent, spur blight will become a problem and spraying will be necessary to control it.

The data herein reported showed that an application of 1 per cent Elgetol at the green-tip stage gave a satisfactory reduction in disease occurrence, except on Indian Summer. As a result of these studies, it appears that a thoro application of 1 per cent Elgetol each year for three successive seasons would reduce spur blight to such a degree that the disease could be held in check during subsequent years with very light applications.

Of organic fungicides tested for use as cover sprays, Fermate is the only one that is available at this time. Two applications of Fermate, 2–100, the first when the new shoots were about 12 inches high and the second 2 weeks later, gave perfect control on Indian Summer. Even a single application made when the new shoots were about 12 inches high gave excellent control. If Fermate is not available, the best alternative is to practice proper horticultural methods and apply Elgetol at the green-tip stage in the spring. When this treatment is followed by bordeaux mixture, 3–3–100, applied when the new shoots are about 12 inches high, increased disease control will be obtained. When cover sprays are applied to raspberries for spur blight control, they should be directed towards the new shoots and should not be allowed to contact the fruiting canes any more than is absolutely necessary.

SUMMARY AND CONCLUSIONS

Spur blight is a disease of red raspberries caused by *Didymella applanata* (Niessl.) Sacc. At times, it causes severe losses in many plantings in New York State.

Investigations were conducted from 1938 to 1944, inclusive, to determine the relative susceptibility of some varieties of red raspberries, the effectiveness of different fungicides, and the proper time of application.

Three years' data showed that Indian Summer and Taylor were very susceptible; Newburgh, Latham, and Milton, moderately susceptible; and Ontario, Viking, Cuthbert, Marcy, and Chief, slightly susceptible.

In the early phase of the investigations, bordeaux mixture, 6–10–100, and Cuprocide 54, 2–100, applied when the new shoots were 10 to 12 inches high and again 2 weeks later, gave some control of spur blight.

Laboratory tests indicated that 1 per cent Elgetol would kill the perithecia of *D. applanata* on the diseased canes. Field results showed that 1 per cent Elgetol was superior to ½ per cent Elgetol, 1 per cent Elgetol 312, and lime-sulfur, 1–8, for the control of spur blight when applied to the canes in the green-tip stage. Elgetol was more effective when used on Newburgh, Latham, and Chief than on Indian Summer. Elgetol gave the best control when it was applied at the time that the buds showed about ½ inch of green tissue as compared with applications made at the dormant or breaking-bud stages. No injury resulted from Elgetol when the buds showed as much as 1 inch of green tissue.

In some years, cover sprays of bordeaux mixture or Cuprocide applied to the new shoots following the green-tip application of Elgetol gave increased disease control over that obtained with Elgetol alone.

Fermate, 2–100, gave excellent control of spur blight on the Indian Summer when either one or two applications were used and was much superior to any of the other spray treatments tested. U. S. R. No. 604, 1–100 and ½–100, and Dithane, 1–100, gave excellent control but are not available except for experimental work.

The data show that if Fermate cannot be obtained, the next best treatment is a green-tip application of 1 per cent Elgetol, followed by an application of bordeaux mixture, 3–3–100, when the new shoots are about 10 to 12 inches high.